

NESTING BIRD ECOLOGY OF FOUR PLANT COMMUNITIES IN THE MISSOURI RIVER BREAKS, MONTANA

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THE Missouri River "Breaks" is a name that has been applied to that section of the immediate Missouri River Valley which stretches approximately 180 miles between Fort Benton and the Fort Peck Reservoir, Montana. This stretch of the river is divided by topographic features into three separate units—The Fort Benton-Virgelle unit, the White Rocks-Badlands unit, and the Fort Peck Game Range. This region is of particular interest since it represents a stretch of the river that retains much of the same aspect as when first seen by Lewis and Clark, fur trappers, and steamboat passengers.

Because of the tremendous size of the "breaks" area, my studies were concentrated in that area known as the White Rocks-Badlands unit which originates approximately 42 river miles downstream from Fort Benton in north-central Montana. This area was selected because of its limited accessibility, "pristine" wilderness aspect, because there have been no published avifaunal investigations for this specific area, and lastly, because the U.S. Army Corps of Engineers has proposed several dam sites for water-resource development. Inundation would destroy the most unique geological, historical, paleontological, and biological features found in this stretch of the river. The study area consisted of a straight-line distance of about 33 miles (45 river miles). The purpose of this paper is to describe the breeding bird populations of the major habitats and to establish certain ecological relationships between these populations and their communities. Preliminary observations were made in 1967 with quantitative data obtained during the summer of 1968.

METHODS

Study areas were selected in each vegetation type that were typical of that type and that had a minimum amount of disturbance. Study areas in the greasewood-sagebrush shrubland, sagebrush grassland, and pine-juniper woodland were 40 acres in size with dimensions of 660 × 2640 feet. Each area was censused at 220 foot intervals. Because of the strip-like nature of these areas, one source of error present in mapping territories is that some territories included some area beyond the boundaries of the study zone. Care was taken, where possible, to select areas with physiographic barriers and distinct plant communities isolating such areas, thereby reducing the error. Located on an abandoned meander, the study area in the cottonwood forest consisted of an area 17.5 acres in size and was censused at 150 foot intervals.

Breeding bird populations were studied with the aid of composite census maps similar to those described by Kendeigh (1944). Descriptive data on such maps included birds seen and singing males, location of active nests, eggs per nest, young out

of the nest, and behavioral activities related to nesting. Long poles, to tap silver sagebrush (*Artemisia cana*) plants, aided in flushing nesting birds during each census in the sagebrush-grassland community. A Labrador dog was also used in this type for flushing Ring-necked Pheasants.¹

Census periods and times for each study plot were as follows: cottonwood forest (8 trips, 2-8 June; census time, 06:00-09:30), sagebrush-grassland (6 trips, 9-14 June; 06:00-08:30), greasewood-sagebrush shrubland (6 trips, 16-21 June; 06:00-09:00), pine-juniper woodland (6 trips, 25-30 June; 06:00-10:00). Visits to the plots for other purposes supplied confirmatory data beyond the time spent in formal censusing.

The method of vegetation analysis was a modification of this method of Daubenmire (1959), whereby 2 × 5 dm plots were systematically placed within a relatively homogenous and undisturbed portion of each habitat studied. Measurements were also taken at nest sites for certain avian species to attempt to ascertain nesting requirements, whereby 20 × 50 foot sample units, each containing 20 systematically arranged 2 × 5 dm plots enclosed separate nest sites. The per cent canopy coverage of each taxon (per cent of area covered by foliage), the average frequency (percentage occurrence among plots), and percentage of bare ground, rock and lichens were recorded for each plot. Canopy coverage classes were: 1 = 0-5 per cent; class 2 = 5-25 per cent; class 3 = 25-50 per cent; class 4 = 50-75 per cent; class 5 = 75-95 per cent; and class 6 = 95-100 per cent. The midpoint of each class was the value used in data tabulations. Comparative data for these types are presented in Table 1. The botanical nomenclature follows that of Booth (1950) and Booth and Wright (1959).

VEGETATION

The study area lies in the Prairie Biome, more specifically, the Mixed Prairie which is composed predominantly of mid and short grasses. Vegetation in the White Rocks-Badlands unit is varied due to ridges, sharply cut coulees, and creek bottoms. The major plant communities in the study area are as follows:

Greasewood-Sagebrush Shrubland.—Where clay soils containing considerable amounts of sodium occur, the vegetation is characteristically sparse and dominated by greasewood (*Sarcobatus vermiculatus*)—a point established by Mackie (1965). Distribution of greasewood, big sagebrush (*Artemisia tridentata*), and silver sagebrush ranges from sparse to moderate along Missouri River bottomlands, coulee-bottom benches, small alluvial fans, and hills with exposed bentonite beds. Principal forbs include woolly plantain (*Plantago purshii*), western stick tight (*Lappula redowskii*), littlepod false flax (*Camelina microcarpa*), and plains prickly pear (*Opuntia polycantha*). Dominant grasses include downy chess brome (*Bromus tectorum*), western wheatgrass (*Agropyron smithii*), and desert saltgrass (*Distichlis stricta*).

Sagebrush Grassland.—Relatively dense stands of silver sagebrush ranging in height from two to six feet occur extensively along the Missouri River bottom lands and coulee bottoms having intermittent stream flow. Western wheatgrass, the former dominant in this type, has been greatly replaced by the invader downy chess brome. The distribution and fluctuation of these two grasses is related to livestock distribution and intensity of grazing. In areas where extensive grazing has occurred in silver sagebrush, subsequent erosion has produced hard, clay-pan soils, with reduced vegetative cover. Meadow barley (*Hordeum brachyantherum*), woolly plantain, and littlepod false flax are common in such areas. The canopy coverage for silver sagebrush is more extensive and the total forb and grass coverage is greater than that of the greasewood-sagebrush shrubland.

¹ Scientific names of birds are given in Table 2.

TABLE 1 (Continued)

	Greasewood- Sagebrush Shrubland		Sagebrush Grassland		Pine- Juniper Woodland		Cottonwood Forest	
Trees								
<i>Pinus flexilis</i>								
<i>Juniperus scopulorum</i>								
<i>Juniperus communis</i>								
<i>Populus sargentii</i>								
<i>Fraxinus pennsylvanica</i>								
<i>Acer negundo</i>								
Rocks	1	18			5	41		
Lichens	5	72	1	13	1	25		
Bare Ground	20	88	3	25	28	79		

Pine-Juniper Woodland.—This community occurs extensively on slight to moderately steep slopes in those areas where Eagle Sandstone is exposed. Stands of limber pine (*Pinus flexilis*) and Rocky Mountain juniper (*Juniperus scopulorum*) are typically scattered in these areas. The understory shrub layer is composed of common juniper (*Juniperus communis*) and skunkbush sumac (*Rhus trilobata*). Principle forbs and grasses include hood's phlox (*Phlox hoodii*), *Carex* spp., and junegrass (*Koeleria cristata*). Small hills with moderately cut drainageways separating such stands are common. Such areas support a variable vegetation comprised of dense growths of skunkbush and common juniper in the drainageways, and big sagebrush, plains prickly pear, yucca (*Yucca glauca*) and needle and thread (*Stipa comata*) on the periphery.

Cottonwood Forest.—The cottonwood habitat, dominated by plains cottonwood (*Populus sargentii*), is found along Missouri River bottom lands and on numerous islands in this reach of the river. The larger groves show three distinct strata. Cottonwood comprises the upper stratum (18–19 m); the second stratum consists of green ash (*Fraxinus pennsylvanica*) (2–11 m), and scattered box elder (*Acer negundo*); the third stratum consists of moderate to heavy thickets of western snowberry (*Symphoricarpos occidentalis*) and nootka rose (*Rosa nutkana*). Litter accumulation is quite heavy in the larger cottonwood groves resulting in limited growth of forbs and grasses. The most common forb is American vetch (*Vicia americana*) and the most common grass is blue-bunch wheatgrass (*Agropyron spicatum*). Heavy silting from flooding has undoubtedly influenced the species composition and vegetation grouping patterns in those areas subjected to a high frequency of flooding.

Other vegetation types of lesser importance found in the study area but not quantitatively analyzed include small islands covered with *Salix* spp. and low herbaceous growth; numerous long, open canyons with dissected drainageways that support a variable growth in vegetation; and limited stands of Douglas fir (*Pseudotsuga menziesii*) associated with limber pine.

RESULTS

Greasewood-Sagebrush Shrubland.—Lark Sparrows and Western Meadowlarks were the two most abundant species found in this habitat (Table 2).

TABLE 2
NESTING BIRDS (PAIRS PER 100 ACRES) FOUND IN FOUR PLANT COMMUNITIES OF THE
WHITE ROCKS-BADLANDS UNIT

Type of habitat	Greasewood- Sagebrush Shrubland	Sagebrush Grassland	Pine- Juniper Woodland	Cottonwood Forest
No. of acres	40	40	40	17.5
Species				
Ferruginous Hawk (<i>Buteo regalis</i>)				6
Pigeon Hawk (<i>Falco columbarius</i>)				6
Sparrow Hawk (<i>Falco sparverius</i>)				6
Ring-necked Pheasant (<i>Phasianus colchicus</i>)		5		
Mourning Dove (<i>Zenaidura macroura</i>)	b	5	50	13
Black-billed Cuckoo (<i>Coccyzus erythrophthalmus</i>)				a
Great Horned Owl (<i>Bubo virginianus</i>)				6
Saw-whet Owl (<i>Aegolius acadicus</i>)			3	
Common Nighthawk (<i>Chordeiles minor</i>)			a	
Red-shafted Flicker (<i>Colaptes cafer</i>)				6
Downy Woodpecker (<i>Dendrocopos pubescens</i>)				13
Eastern Kingbird (<i>Tyrannus tyrannus</i>)				13
Western Kingbird (<i>Tyrannus verticalis</i>)			3	13
Least Flycatcher (<i>Empidonax minimus</i>)				13
Western Wood Pewee (<i>Contopus sordidulus</i>)				a
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)			a	
Black-billed Magpie (<i>Pica pica</i>)				6
Black-capped Chickadee (<i>Parus atricapillus</i>)				13

TABLE 2 (Continued)

Type of habitat	Greasewood- Sagebrush Shrubland	Sagebrush Grassland	Pine- Juniper Woodland	Cottonwood Forest
No. of acres	40	40	40	17.5
House Wren (<i>Troglodytes aedon</i>)			5	45
Rock Wren (<i>Salpinctes obsoletus</i>)			5	
Catbird (<i>Dumetella carolinensis</i>)				13
Brown Thrasher (<i>Toxostoma rufum</i>)			8	
Robin (<i>Turdus migratorius</i>)			15	26
Swainson's Thrush (<i>Hylocichla ustulata</i>)				13
Veery (<i>Hylocichla fuscescens</i>)				a
Cedar Waxwing (<i>Bombycilla cedrorum</i>)				13
Loggerhead Shrike (<i>Lanius ludovicianus</i>)			5	
Starling (<i>Sturnus vulgaris</i>)				19
Red-eyed Vireo (<i>Vireo olivaceus</i>)				19
Yellow Warbler (<i>Dendroica petechia</i>)				52
Yellowthroat (<i>Geothlypis trichas</i>)				13
American Redstart (<i>Setophaga ruticilla</i>)				19
Western Meadowlark (<i>Sturnella neglecta</i>)	25	10	13	
Baltimore Oriole (<i>Icterus galbula</i>)				6
Bullock's Oriole (<i>Icterus bullockii</i>)				13
American Goldfinch (<i>Spinus tristis</i>)				6
Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>)			8	13

TABLE 2 (Continued)

Type of habitat	Greasewood-Sagebrush Shrubland	Sagebrush Grassland	Pine-Juniper Woodland	Cottonwood Forest
No. of acres	40	40	40	17.5
Lark Bunting (<i>Calamospiza melanocorys</i>)	5			
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)				6
Vesper Sparrow (<i>Pooecetes gramineus</i>)		5		
Lark Sparrow (<i>Chondestes grammacus</i>)	30	5	18	
Chipping Sparrow (<i>Spizella passerina</i>)			13	
Brewer's Sparrow (<i>Spizella breweri</i>)	5	48		
Total pairs per 100 acres	65	78	146	390

^a Indicates species present on study area but density low or difficult to assess.

^b Indicates species which nested outside the study plot in this habitat and species frequently observed but not definitely known to nest in the study plot.

These species comprised 46 per cent, and 39 per cent, respectively, of the total breeding population.

Although the presence of greasewood and big sagebrush appears to be a nesting requirement for the Lark Sparrow, nest data indicate more specific nesting requirements with regard to big sagebrush. Of the eight Lark Sparrow nests located, seven were found on the ground directly under big sagebrush, but only one under greasewood. Vegetative measurements taken at four separate nests, based on four 20 × 50 sample units showed greasewood with a canopy coverage averaging 14 per cent and life form measurements of 0.37 m (height of shrub) × 0.6 m (width of crown). Big sagebrush had similar life form measurements of 0.54 × 0.62 m and a canopy coverage averaging 15.6 per cent. Examination of Table 1 shows that the average frequency ratings for both shrubs were quite similar.

A comparison of the life forms for big sagebrush and greasewood shows that the former has many more overhanging branches that could be used for nest concealment and protection. The lowermost branches of greasewood, in contrast, are more upright thereby providing less overhang and coverage. Because the lowermost branches of greasewood are not positioned as well as those of big sagebrush to intercept rainfall, the soil tends to be more compact forming a "hardpan" layer under the plants. The surface soil texture

under big sagebrush is more granular, has a higher percentage of litter, and lacks this hardpan consistency. It seems quite probable that nest depressions could be excavated with greater ease in such a substrate. The difference in soil porosity for these two shrubs strongly suggests that porosity may be an important factor in nest selection.

The Western Meadowlark was found in areas having more herbaceous and grass cover and with more widely dispersed shrubs than were present in the habitat of the Lark Sparrow. Each of the two meadowlark nests located was built adjacent to the paddles of prickly pear cactus. Two meadowlark nests found in the pine-juniper woodland were similarly located in prickly pear cactus. Cameron (1907) also reported a nesting bird in a cactus patch for eastern Montana.

Sagebrush-Grassland.—The most abundant species, Brewer's Sparrow, comprised 61 per cent of the total breeding population for this habitat.

After charting the locations of 15 active Brewer's Sparrow nests on the composite census maps, it was evident that this species preferred silver sagebrush areas having a canopy coverage of around 50 per cent for nest sites. Quantitative measurements, based on 80 Daubenmire plots, showed substantial differences in the utilization of sagebrush by this species for nesting purposes. Most of the nests, eleven or 73 per cent, were found in silver sagebrush areas having a canopy coverage averaging 53 per cent. Shrubs averaged one meter high by 1.2 meters wide. Low density sagebrush areas in which one nest was found included shrubs having a canopy coverage of 24 per cent and physical measurements of 0.4×0.56 m. Three nests (20 per cent) were found in dense sagebrush areas averaging 1.4×1.6 m and had a canopy coverage of 81 per cent. The physiognomy or structure of the vegetation in this habitat appears to be quite important in the selection of nest sites thereby influencing the distribution of birds.

Feist (1968) in his study of five 40-acre plots of big sagebrush-grassland in central Montana, maintained that the Brewer's Sparrow preferred dense sagebrush areas for nest sites with a canopy coverage averaging 31 per cent. While there is some overlap in regard to the height and canopy coverage of silver sagebrush utilized by this species, it is my belief that dense silver sagebrush areas are used less frequently in comparison with those of big sagebrush.

Pine-Juniper Woodland.—Scattered stands of limber pine and juniper separated by open herbaceous-grassy areas with associated dissected drainageways containing numerous brush pockets, provided a diversified ecological community for nesting birds.

Mourning Doves, the most abundant nesting bird for this type, were dispersed throughout the study area and nests were located in all cover types.

TABLE 3

COMPARISON OF PER CENT CANOPY COVERAGE AND GROUND COVER CHARACTERISTICS AT LARK SPARROW NESTING SITES IN THE GREASEWOOD-SAGEBRUSH SHRUBLAND AND PINE-JUNIPER WOODLAND COMMUNITIES

Canopy coverage and ground cover characteristics	Greasewood-Sagebrush Shrubland	Pine-Juniper Woodland
Shrubs	15	18
Forbs and Grasses	45	44
Lichens	7	2
Rock	1	4
Bare ground	31	36

The ecological adaptability of the Mourning Dove in its ability to nest in conifers, deciduous trees, and a wide variety of shrubs as well as on the ground is well known (Bent, 1932). The dove selected a wide variety of nest sites on the study area. Of the 17 nests located, eight were located on horizontal branches of conifers with limber pine being the preferred species. Although Rocky Mountain juniper was common in the understory of limber pine, it showed a low frequency for nest sites. It was my impression that juniper was not selected for nest sites because of the typical dense and upright branches which result in a poor structural platform. The lowermost branches of limber pine, in contrast, are more horizontal and open, thereby providing more suitable nesting platforms. A horizontal branch appears to be the essential requisite for the nest platform in conifers. Hanson and Kossack (1963) found in their Illinois study of doves that blue spruce (*Picea pungens*) was preferred over four other conifers, including pine, because of its stiff, horizontal branches and needles which provided secure nesting platforms. Hardy (1945) found that the Mourning Dove in a Piñon-Juniper vegetation type preferred juniper to piñon pine (*Pinus edulis*) because the former has larger and more horizontal branches.

Other species showing a nesting preference for conifers were the Chipping Sparrow, Robin, and Loggerhead Shrike. Four of the five Robin nests located were in limber pine and they averaged 3.9 m off the ground. Although only one Chipping Sparrow nest was found, numerous old nests located, all in juniper, suggested that this was the preferred nesting site.

The third most abundant species, the Lark Sparrow, preferred big sagebrush areas similar to those in the greasewood-sagebrush habitat. Vegetative measurements taken at one nest site, based on 20 Daubenmire plots, showed an average total canopy coverage of 64 per cent. Comparison of these data with that of the greasewood-sagebrush habitat shows a remarkable similarity in nesting niches (Table 3).

Brushy, dissected drainageways, containing dense pockets of skunkbush sumac and common juniper provided nesting sites for the Brown Thrasher and Rufous-sided Towhee. Although such areas were not abundant, they were of importance to such species.

Cottonwood Forest.—This community supported the largest number and the greatest variety of species. Thirty species of birds utilized this type for nesting. The cottonwood community offers more opportunities for ecological specialization than the habitats found in the other communities examined. Since this community shows three well-defined strata, and since there were substantial differences in the utilization of each stratum for nesting, the birds for each will be described.

While there was some overlap in nesting niches among the various strata, 12 of the total breeding species nested in the upper cottonwood stratum (House Wren, Red-shafted Flicker, Bullock's Oriole, Downy Woodpecker, Western Kingbird, Baltimore Oriole, Sparrow Hawk, Black-billed Magpie, Great Horned Owl, Ferruginous Hawk, Pigeon Hawk, and Starling). About one-third of these were hole nesters. High intensity winds frequently occur in the "Breaks" area producing a large number of cottonwood culls which make such trees suitable for excavation.

The middle stratum (green ash with scattered box elder) had the lowest number of nesting birds. Eight species, of which the Robin was the most common, nested in this stratum. This stratum has fewer nesting niches in comparison with the upper stratum. For example, the number of culls for excavation were certainly fewer, thereby limiting hole-nesting species.

The lower stratum (rose and snowberry) provided nesting sites for ten species. Vegetation measurements for this stratum showed a total average canopy coverage of 74 per cent. Shrubs (rose and snowberry) averaged 62 per cent with forbs and grasses averaging four per cent. Although snowberry had an average frequency rating similar to that of rose, no nests were found in this shrub. A comparison of life forms shows snowberry as a shrub with numerous slender, drooping branches; rose in contrast, is a more erect shrub having stouter branches armed with numerous spines thereby providing more suitable nesting crotches. This stratum provided the least variety of nesting niches. Typical nesting birds utilizing this stratum were the Yellow Warbler, American Goldfinch, Swainson's Thrush, Catbird, and Veery.

Forest edge species (Rufous-sided Towhee, Yellowthroat, Grasshopper Sparrow, Eastern Kingbird) utilizing rose thickets bordering and encroaching into the sagebrush-grassland community seldom penetrated the cottonwood interior for more than 10–20 feet.

DISCUSSION

The general pattern of the utilization by birds of each habitat for nesting reflects the basic physiognomy or structure of the vegetation. Although there is a certain amount of overlap in plant species and configuration used for nesting, data from this study show that some bird species show a very close adherence to a specific life form of vegetation present, while others are more flexible in using the overall habitat. The Lark Sparrow, for example, appears partial to nesting under big sagebrush while the Mourning Dove is quite adaptable in being able to use a variety of vegetation for nest sites.

The greasewood-sagebrush community is the poorest in species composition and relative density. The density for the five breeding species averaged 65 pairs per 100 acres. The implication is that a low density and productivity of vegetation allow for a low diversity and density of breeding birds. That this suggestion is not necessarily correct is suggested by the data presented earlier in which although big sagebrush and greasewood have similar life forms and frequency ratings, the more granular type soil found under big sagebrush appears to be an important factor in determining Lark Sparrow densities.

The sagebrush-grassland community supported six species with a total nesting density of 78 nesting pairs per 100 acres. As pointed out above, the general pattern of distribution of Brewer's Sparrows in this habitat was a concentration in those areas with shrubs having a canopy coverage averaging 50 per cent. It is possible that shrubs found in such areas may provide more suitable nest sites with overhanging branches that serve to conceal and protect the nest; or perhaps the foliage volume for such shrubs plays an important factor in limiting densities. It is also possible that a difference in the nesting density of Brewer's Sparrow is not under sole control of differences in shrub density and canopy coverage.

The pine-juniper woodland provided a diversified ecological community for nesting birds supporting 14 species and 146 pairs of nesting birds per 100 acres. The high density of Mourning Doves in this habitat is partly explained by the versatility of the species in being able to use a heterogeneous mixture of plant life forms for nesting. Examination of Table 2 shows that the dove was the only species having the ecological adaptability to nest in all of the habitats studied, therefore having the greatest density of breeding birds for the entire study area.

The multi-storied vegetation structure of the cottonwood forest supports the greatest total biomass and contains the largest population of nesting birds (390 pairs per 100 acres) and the greatest number of species (30). Thus, as a natural habitat, the cottonwood forest can be shown to offer more opportunities for ecological specialization than the other habitats.

The information summarized in Table 2 is of value in the sense that it presents an instantaneous description of the four avian communities, but it is incomplete. The reasons for this are: (1) Breeding bird measurements were taken during only a part of the breeding season so the true population might vary from the density figures given. (2) It is not realistic to suggest that the density of nesting pairs of birds per 100 acres for the hawks, owls, kingbirds, and doves in the cottonwood forest is correct. This habitat served primarily to supply nesting sites for these species, and because of the variability of neighboring habitats, it is difficult to make meaningful population adjustments for them. (3) As Brewer (1967) points out, bird populations for a given habitat are a product of many factors, including geographical location of the plant community, geographical ranges of species able to use the habitat, and structural features of the vegetation. Another prime consideration is that of habitat change. There is an apparent difference in relative densities in the study area when comparing bird populations of the same community from one locality to another because of livestock disturbances. I have no quantitative data concerning the interrelationships that exist between livestock and vegetation in the White Rocks-Badlands unit. My observations indicate noticeable differences.

SUMMARY

Intensive studies of the nesting birds in four plant communities representative of the White Rocks-Badlands unit of the Missouri River "Breaks," Montana were conducted during the summer of 1967 and 1968.

The greasewood-sagebrush shrubland has the fewest species and lowest relative density of the four communities. Density for all breeding species averaged 65 pairs per 100 acres. The Lark Sparrow and the Western Meadowlark were numerically the most important species. Although life form measurements and frequency ratings for big sagebrush and greasewood are similar in this habitat, a more granular soil under big sagebrush appears to be a nesting requirement for the Lark Sparrow.

The sagebrush-grassland community supported six species and 78 pairs per 100 acres. The Brewer's Sparrow was by far the most abundant species. The greatest density of nesting Brewer's Sparrows was found in silver sagebrush areas having a canopy coverage of around 50 per cent.

The pine-juniper woodland provided a diversified ecological community for nesting birds and supported about 146 pairs per 100 acres. The Mourning Dove was numerically the most important and was the only species having the ecological adaptability to nest in all of the major habitats found in the study area.

The cottonwood community supported the largest population of nesting birds (390 pairs per 100 acres) and the greatest number of species (30). This community provided more opportunities for ecological specialization and nesting sites than the habitats in the other communities because of its multi-storied vegetation and greater total biomass.

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NOTICE

Members who know students that are interested in ornithology now should send nominations to the Student Membership Committee addressed to Douglas James, Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701. The nominees will be invited by the committee to apply for membership in the Wilson Ornithological Society.